

WHAT IS CLAIMED IS:

1. A liquid crystal display comprising:  
a front panel comprising a front alignment layer having an alignment direction;  
5 a rear panel comprising a rear alignment layer having an alignment direction; and  
a liquid crystal layer between the front and rear alignment layers,  
wherein the liquid crystal layer has a rotational twist angle of about  $90^\circ$ , a pre-tilt angle  
of not more than  $2^\circ$ , and the alignment, material and thickness of the liquid crystal layer are  
such that at the mid-point of the rotational twist, the direction of liquid crystal directors coincide  
10 with an off-normal viewing direction of the liquid crystal display.
2. The liquid crystal display of claim 1 wherein the front panel further comprises a front  
polarizer, and the rear panel further comprises a rear polarizer.
3. The liquid crystal display of claim 2 wherein the transmission axes of the front and rear  
polarizers are perpendicular.
- 15 4. The liquid crystal display of claim 2 wherein the transmission axes of the front and rear  
polarizers are parallel.
5. The liquid crystal display of claim 2 wherein at least one of front and rear polarizers is  
E-type polarizer, and the transmission axis of the E-type polarizer and the alignment direction of  
the alignment layer in the same panel as the E-type polarizer are perpendicular.
- 20 6. The liquid crystal display of claim 5 wherein the E-type polarizer is a thin crystal film  
manufactured from aromatic organic compounds, and the interplanar distance of the thin crystal  
film in the direction of any optical axis is  $3.4 \pm 0.3A$ .
7. The liquid crystal display of claim 6 wherein at least one of the aromatic organic  
compounds contains heterocycles.
- 25 8. The liquid crystal display of claim 6 wherein the thin crystal film is formed from a  
lyotropic liquid crystal based on at least one dichroic dye.
9. The liquid crystal display of claim 8 wherein the thin crystal film is treated with ions of  
bi-or/and trivalent metals.

10. The liquid crystal display of claim 2 wherein the front and rear polarizers are O-type polarizers.
11. The liquid crystal display of claim 10 wherein the transmission axis of the front O-type polarizer is parallel to the alignment direction of the front alignment layer, and the transmission axis of the rear O-type polarizer is parallel to the alignment direction of the rear alignment layer.
12. The liquid crystal display of claim 2 wherein the transmission axis of the front polarizer and the alignment direction of the front alignment layer form an angle from  $0^{\circ}$  to  $90^{\circ}$ .
13. The liquid crystal display of claim 2 wherein the transmission axis of the rear polarizer and the alignment direction of the rear alignment layer form an angle from  $0^{\circ}$  to  $90^{\circ}$ .
- 10 14. The liquid crystal display of claim 2 wherein at least one of the front and rear polarizers is an internal polarizer.
15. The liquid crystal display of claim 14 wherein the internal polarizer has at least one of the functions selected from the group consisting of an alignment layer, color correction filter, retarder, and any combination thereof.
- 15 16. The liquid crystal display of claim 1 further comprises a reflective layer.
17. The liquid crystal display of claim 16 wherein the reflective layer is semitransparent.
18. The liquid crystal display of claim 17 further comprises a backlighting system.
19. The liquid crystal display of claim 1 further comprises an antireflection or antiglare layer.
- 20 20. The liquid crystal display of claim 1 further comprises a light-scattering layer.
21. The liquid crystal display of claim 1 further comprises a retarder layer, a protective layer, an adhesive layer, a color filter, or a layer combining functions of at least two of the said layers.